

ABSTRACT OF THE DISCLOSURE

Provided are exemplary methods for forming a nickel silicide layer and semiconductor devices incorporating a nickel silicide layer that provides increased stability for subsequent processing at temperatures above 450 °C. In particular, the nickel silicide layer is formed from a nickel alloy having a minor portion of an alloying metal, such as tantalum, and exhibits reduced agglomeration and retarded the phase transition between NiSi and NiSi₂ to suppress increases in the sheet resistance and improve the utility for use with fine patterns. As formed, the nickel silicide layer includes both a lower layer consisting primarily of nickel and silicon and a thinner upper layer that incorporates the majority of the alloying metal.